STATE WATER RESOURCES CONTROL BOARD
DIVISION OF FINANCIAL ASSISTANCE
PRELIMINARY FUNDING COMMITMENT (PFC)
CLEAN BEACHES INITIATIVE (CBI) GRANT PROGRAM
FAAST PIN: 24692

RECIPIENT: SOUTHERN CALIFORNIA COASTAL WATER RESEARCH PROJECT (SCCWRP)

PROJECT TITLE: DETERMINATION OF DNA-BASED FECAL MARKER AGING CHARACTERISTICS FOR USE IN QUANTITATIVE MICROBIAL SOURCE TRACKING (PROJECT)

TOTAL PROJECT COST: $1,402,806 **TOTAL CBI GRANT REQUEST:** $1,402,806

GRANT MANAGER: Andrew Tsiu, Environmental Scientist (916-319-9123 or AndrewTsiu@Waterboards.ca.gov)

AUTHORITY

The Clean Beaches Initiative (CBI) Grant Program provides funding for projects that restore and protect the water quality and the environment of coastal waters, estuaries, bays and near shore waters. The CBI Grant Program was initiated in response to the poor water quality and significant exceedances of bacterial indicators revealed by Assembly Bill (AB) 411 monitoring at California's beaches. Funding is available from the *Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act* (Proposition 84). In addition, there are unused or re-appropriated funds remaining from the *California Clean Water, Clean Air, Safe Neighborhood Parks, and Coastal Protection Act of 2002* (Proposition 40) and the *Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002* (Proposition 50).

The State Water Board adopted Resolution No. 2012-0020 on June 5, 2012, which revised the CBI Guidelines used to solicit applications, evaluate proposals, and award grants for Proposition 84, Chapter 7 funds, and any unused or re-appropriated Proposition 40 and 50 CBI funds. The resolution authorized the Deputy Director of the Division of Financial Assistance (Division) to approve proposed projects, execute grant agreements and amendments to implement the proposed projects and utilize funds from projects which are withdrawn or completed under budget to fund additional projects recommended by the Clean Beaches Task Force (CBTF), or augment the scope and budget of projects previously awarded.

The Concept Proposal for this Project was submitted to FAAST on August 22, 2012 by The Regents of the University of California, on behalf of its Santa Barbara Campus. The CBTF met on October 22, 2012 and recommended this Project be invited to submit a detailed application but to also include an additional research group. The project team and cooperating entities decided in full support that SCCWRP become the lead applicant. SCCWRP submitted a Detailed Application on July 03, 2013, and it has been determined to be complete. This PFC shall be posted on the State Water Board's internet website, and circulated to the CBTF for review and comment prior to the Deputy Director executing a grant agreement.

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Determination of DNA-Based Fecal Marker Aging Characteristics For Use in Quantitative Microbial Source Tracking
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PROJECT OBJECTIVE

Highly sensitive and specific microbial source tracking (MST) assays have been developed, and this is a great advancement for indicating potential sources of pollution in recreational waters. Still, there is a striking lack of knowledge on how aging of fecal contamination affects concentrations of fecal indicator bacteria (FIB), host-specific markers, and pathogens. While prior studies have looked at aging of feces and their biological constituents, these studies have rarely looked at FIB, markers, pathogens, and other members of the entire microbial community, concurrently. This information (the concurrent decay profile) is needed to develop source allocation and other (probabilistic) methods for interpreting marker data, and to assess health risk with MST results. The goal of the proposed work is to better understand these concurrent decay profiles at CA beaches. This will inform field measurement interpretation, source allocation, and identification of human impacted beaches in CA.

PROJECT DESCRIPTION

The proposed research will include three overall components:

1) Field aging studies to determine the rates of DNA-based marker decay, relative to FIB and pathogen decay (i.e., concurrent decay profiles of the three), under real field conditions. The concurrent decay profile of all components of the entire microbial community will also be investigated by comprehensive community analysis (i.e., PhyloChip and Illumina next generation sequencing). This study will be replicated in three representative sites representing the typical surface water types in California (i.e., a baseflow freshwater site, a brackish water coastal lagoon site, and a surf zone site). The effect of environmental factors (such as temperature, sunlight) will be assessed through replicating the study at each site during winter, summer with no shading and summer with shading. Sewage, cow feces, and gull feces will serve as microbial seeds for these experiments.

2) Laboratory aging studies to verify, fine tune, and interpret findings from field studies. Two laboratory microcosm studies will be conducted: a water matrix effect investigation and a sediment effect investigation. Many parameters associated with the water matrix (such as salinity, nutrients, abundance and diversity of predators) can significantly affect fecal material decay. Although the field studies would gather knowledge on three main types of water matrix (baseflow freshwater, brackish lagoon water, and ocean water), whether and how these findings may be extrapolated to waters from other locations in California need to be studied. In the water matrix effect investigation, fecal material aging in 12 waters (i.e., 3 from each of the 4 California regions represented by the principal investigators) will be investigated by laboratory microcosm studies. Additionally, many studies have documented links between FIB levels in sand and water in the environment, and indicated that sediments may provide a favorable environment for pathogen survival. However, mechanisms controlling for exchange between the sediment and water column are complex, and sediment effects on fecal material aging are difficult to delineate in the field. Laboratory microcosms under controlled conditions will provide valuable information for interpreting findings of field studies. In the sediment effect investigation, sediments and waters from the three field sites will be used to set up microcosms to delineate if and how sediments affect decay of various subsets of the microbial community (i.e., FIB, DNA-based marker, and pathogen).

3) Completion and demonstration of the probabilistic and ratio methods as practical tools for water quality managers to conclude the likelihood of a source contaminant (probabilistic), or to

attribute FIB to specific sources (ratio method). Additionally, a heuristic model may be produced to guide managers on the extent of FIB, DNA-based marker, and pathogen decay, given the set environmental conditions and fecal sources at their sites.

The total eligible cost of the Project is $1,402,806. SCCWRP requested a CBI grant amount of $1,402,806 for the Project.

ENVIRONMENTAL IMPACT

For this project, the Division has filed a Notice of Exemption (NOE) for CEQA compliance at the State Clearing House on May 22, 2013. The project meets the following exemptions:

Section 15306: Class 6 Information Collection - Basic data collection and research with no disturbance to an environmental resource. No environmental impacts are expected a result of this project.

FISCAL IMPACT

As of July 1, 2012, the cumulative balance available for the CBI Grant Program funded by Proposition 40, 50, and 84 is:

July 1, 2012:	$49,520,820
Fiscal Year 2012-2013 Approved Projects	--
Draft PFCs (proposed commitments):	$7,333,439
SCCWRP - FAAST PIN: 24692	$1,402,806
Funds Remaining for Future Commitments:	$40,784,575

REGIONAL WATER BOARD IMPACT

The Project does not directly impact a Regional Water Board. The Los Angeles Regional Water Board and the State Water Board's Division of Water Quality support the Project.

ROUTINE, NON-CONTROVERSIAL PROJECT

The proposed Project is routine and non-controversial based on Division staff's consideration of the documents and information provided by SCCWRP, regulatory agencies, and written responses from the general public. There has been no indication of a protest or controversy regarding the proposed Project.

PUBLIC REVIEW

The PFC will be posted on the State Water Board's internet website for public review for 10 days.

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APPROVAL

Using the authority delegated by the State Water Resources Control Board on June 05, 2012, in Resolution No. 2012-0020, I hereby:

Approve a Clean Beaches Initiative Grant Program PFC of $1,402,806 for SCCWRP's Determination of DNA-Based Fecal Marker Aging Characteristics For Use in Quantitative Microbial Source Tracking Project.

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Elizabeth L. Haven, Deputy Director
State Water Resources Control Board
Division of Financial Assistance

Date

Reviewed by:
Office of Chief Counsel
Date: